The U.S. Department of Energy's Office of Fossil Energy

Budget in Brief FY 12

Office of Fossil Energy (FE) programs are focused on activities related to the reliable, efficient, affordable and environmentally sound use of fossil fuels, and enhancing U.S. economic, environmental, and energy security. FE manages DOE's Fossil Energy Research and Development Program and also operates the Strategic Petroleum Reserve, the Northeast Home Heating Oil Reserve, Naval Petroleum and Oil Shale Reserves, and Elk Hills School Lands Fund.

FOSSIL ENERGY RESEARCH AND DEVELOPMENT

Secure, affordable, and environmentally acceptable energy sources are essential to the nation's security and economic prosperity. The Fossil Energy Research and Development (FER&D) program advances technologies related to the reliable, efficient, cost-effective, and environmentally sound use of fossil fuels, which provide about 83 percent of U.S. energy consumption. To help meet this demand, the program is developing fuel systems and practices that will provide current and future generations with clean, efficient, reasonably priced and reliable energy from the nation's abundant fossil fuel resources.

Consequently, the mission of the program is to create technology and technology-based policy options for public benefit by enhancing U.S. economic, environmental, and energy security. This mission is achieved by developing technologies to enable the clean use of domestic fossil fuels with the goal of achieving near-zero atmospheric emissions power production, including a specific focus on dramatic reductions of global carbon emissions at acceptable cost.

The FER&D program supports the recommendations of President Obama's Interagency Task Force on Carbon Capture and Storage and DOE's mission to achieve national energy security in an economic and environmentally sound manner through the development of the technical capability to dramatically reduce carbon emissions to achieve

FE R&D includes initiatives to improve the efficiency and performance of advanced turbines. Photo courtesy of Siemens.

Increasing system efficiencies and reducing CCS capital costs is one focus area for FER&D.

near-zero atmospheric emissions. To achieve this goal, the program is focused on developing and demonstrating advanced power generation and carbon capture and storage (CCS) technologies for existing facilities and new fossil-fueled power plants, to increase overall system efficiencies and reduce CCS capital costs. In the near-term, advanced technologies that increase the power generation efficiency for new plants and technologies to capture carbon dioxide (CO_2) from both new and existing plants are being developed. In the longer term, the goal is to increase energy plant efficiencies and reduce both the energy and capital costs of CO_2 capture and storage from new, advanced coal plants and existing plants. These activities will help allow coal to remain a strategic fuel for the nation while enhancing environmental protection.

Consequently, the core R&D of FE's Carbon Capture and Storage and Power Systems program focuses on a variety of CCS technologies for pulverized coal (PC), oxy-combustion and gasification plants: post-combustion capture for new and existing plants, improved gasification technologies, development of stationary power fuel cells, improved turbines for future coal-based combined cycle plants and creation of a portfolio of technologies that can capture and permanently store greenhouse gases.

The FE program also continues to support the DOE Secretary's goals of Innovation, Securing America's Energy Future, and Security. Through the FE program, the U.S. has become a world leader in CCS science and technology. CCS commercialization and deployment will enable the continued use of coal, the largest source of domestic electricity generation, while helping to mitigate environmental impacts related to increasing atmospheric levels of CO_2 due to human activity. Regarding specific program components in the FY 2012 budget request:

➢ The CCS Demonstrations Program, including the Clean Coal Power Initiative, FutureGen 2.0, and Industrial CCS Demonstrations funded by the Recovery Act, enables and accelerates the deployment of advanced carbon capture and storage technologies to ensure clean, reliable, and affordable electricity for the United States. The three major components of the CCS Demonstration Program are cost-shared partnerships between the government and industry to develop and demonstrate advanced coal-based power generation and industrial technologies at the commercial scale.

➢ The CCS and Power Systems Program directly supports the mission of FER&D by conducting and supporting long-term, high-risk R&D to significantly reduce coal power plant emissions (including CO_2) and substantially improve efficiency to reduce carbon emissions, leading to a viable near-zero atmospheric emissions coal energy system and supporting carbon capture and storage.

The Carbon Capture sub-program is focused on the development of post-combustion and pre-combustion CO_2 capture technologies for new and existing power plants. Post-combustion CO_2 capture technology is applicable to PC power plants, which is the current standard industry technology for coal-fueled electricity generation. Pre-combustion CO_2 capture is applicable to gasification-based systems such as Integrated Gasification Combined Cycle (IGCC), a technology for potential large-scale future generation of electricity.

The Carbon Storage sub-program advances safe, cost effective, permanent geologic storage of CO_2. R&D in this area was previously funded under the Carbon Sequestration activities. The technologies developed and large-volume injection tests conducted through this sub-program will be used to benefit the existing and future fleet of fossil fuel power generating facilities by creating tools to increase our understanding of geologic reservoirs appropriate for CO_2 storage and the behavior of CO_2 in the subsurface. No funding is provided for reforestation or other terrestrial carbon sequestration.

The Advanced Energy Systems sub-program focuses on improving the efficiency of coal-based power systems, enabling affordable CO_2 capture, increasing plant availability, and maintaining the highest environmental standards. The program supports gasification-related R&D to convert coal into synthesis gas (syngas) that can be converted into electricity, chemicals, hydrogen, and liquid fuels. In addition, this sub-program advances hydrogen turbine designs to improve the performance of pre-combustion CO_2 capture systems and supports the development of advanced combustion systems through research focused on new high-temperature materials and the continued development of oxy-combustion technologies.

The Cross-cutting Research sub-program serves as a bridge between basic and applied research by fostering the development and deployment of innovative systems for improving efficiency and environmental performance through the research and development of instrumentation, sensors, and controls

targeted at enhancing the availability of advanced power systems while reducing costs. This program area also develops computation, simulation, and modeling tools focused on optimizing plant design and shortening developmental timelines. The Cross-cutting Research activity also addresses advanced and cross-cutting issues, including plant optimization technologies, environmental and technical/economic analyses, coal technology export, and integrated program support.

➢ The Natural Gas Technologies R&D Program developed scientific information and advanced methods for producing gas hydrate resources. Consistent with Administration policy to phase out inefficient fossil fuel subsidies, the program is requesting no funding in FY 2012 for R&D to increase hydrocarbon production.

PETROLEUM RESERVES

Strategic Petroleum Reserve (SPR)

SPR provides strategic and economic security against foreign and domestic disruptions in oil supplies via an emergency stockpile of crude oil. The program fulfills U.S. obligations under the International Energy Program, which avails the U.S. of IEA assistance through its coordinated energy emergency response plans, and provides a deterrent against energy supply disruptions.

The FY 2012 budget proposes a SPR program that is fully responsive to the needs of the nation and the public and is also environmentally responsible. The budget provides for the management, maintenance, security, and operational readiness of the SPR's oil storage and distribution facilities; the completion of construction activities and the transfer of oil from an existing Bayou Choctaw site cavern that poses a major environmental risk to a replacement storage cavern; and continues vapor pressure mitigation activities to ensure the availability of crude oil inventories at SPR sites within environmental and safety constraints.

Northeast Home Heating Oil Reserve

On July 10, 2000, the President directed DOE to establish a Northeast heating oil reserve which is capable of assuring a short-term supplement to private home heating oil supplies during times of very low inventories or in the event of significant threats to immediate energy supplies. The reserve provides a supplemental emergency supply of heating oil for up to 10 days, which is the time required for ships to carry heating oil from the Gulf of Mexico to New York Harbor.

The SPR Bryan Mound site near Freeport, Texas.

Naval Petroleum and Oil Shale Reserves (NPOSR)

NPOSR will continue with environmental remediation activities and determination of equity finalization of Naval Petroleum Reserve No. 1 (NPR-1). Production operations will be discontinued at the Naval Petroleum Reserve 3 in Wyoming, a stripper well oil field, except for incidental oil production associated with produced water needed for low-temperature geothermal testing at the Rocky Mountain Oilfield Testing Center. Geothermal testing will be limited to 100 percent funds-in projects and those projects wholly funded by DOE's Geothermal Technology Program. Environmental Remediation will be performed on those facilities that no longer have value to the geothermal testing mission.

Since the NPOSR no longer served the national defense purpose envisioned in the early 1900s, the National Defense Authorization Act for FY 1996 (P.L. 104-106) required the sale of the government's interest in NPR-1. To comply with this requirement, the Elk Hills field in California was sold to Occidental Petroleum Corporation in 1998, two of the Naval Oil Shale Reserves (NOSR-1 and NOSR-3) were transferred to the Department of the Interior's Bureau of Land Management, and the NOSR-2 site was returned to the Northern Ute Indian Tribe. The Energy Policy Act of 2005 transferred administrative jurisdiction and environmental remediation of Naval Petroleum Reserve 2 (NPR-2) in California to the Department of the Interior, except for eight small unused drill sites in Ford City. DOE retains the Naval Petroleum Reserve No. 3 (NPR-3) in Wyoming (Teapot Dome field).

Weyburn-Midale is a commercial-scale project recognized by the Carbon Sequestration Leadership Forum that will utilize CO_2 for enhanced oil recovery. Photo of CO_2 pipeline as it enters Weyburn from Beulah, N.D., courtesy of Petroleum Technology Research Centre.

Program Budget Highlights

Fossil Energy R&D

Activities include research, development and demonstrations that will improve the competitiveness of near-zero emissions fossil fueled electricity generation in future energy supply markets through technologies that cost-effectively capture and store CO_2, providing a domestic, low-cost, low-CO_2 energy supply option.

In FY 2012 and through the Recovery Act, the Coal program continues aggressive funding for CCS activities, including large volume injection and storage of CO_2 in geologic formations through the Regional Carbon Sequestration Partnerships (RCSP) and large-scale demonstration of carbon capture technologies through the CCS Demonstration Program.

➢ CCS and Power Systems (FY 2012 Request: $291.4*)

Carbon Capture (FY 2012 Request: $68.9) — The increase in funding ($22.4) for Post-Combustion will fund slip stream testing of a larger number of advanced technology systems and will shorten the time required for development of systems ready for commercial application while the decrease in funding (-$2.2) for Pre-Combustion Capture Systems represents program prioritization on post-combustion capture technology development. The program plans to achieve its pre-combustion capture targets later than previously projected.

Carbon Storage (FY 2012 Request: $115.5) — An increase in funding ($7.0) for the RCSPs validation and development field projects ensures that the projects can maintain their schedule for completing site characterization and injection operations. Five of six Best Practices Manuals—which capture the experience and lessons learned through the small and large field tests as well as other research and development of associated technologies—have been completed, with the final scheduled for completion in FY 2011. In FY 2012, projects previously selected that looked at technologies for geologic storage will continue their efforts, as will initiatives for monitoring, verification, accounting and assessment, and carbon use and reuse.

Advanced Energy Systems (FY 2012 Request: $64.2) — This sub-program focuses on improving the efficiency of coal-based power systems, enabling affordable CO_2 capture, increasing plant availability, and maintaining the highest environmental standards. The program supports gasification-related R&D to convert coal into synthesis gas (syngas) that can in turn be converted into electricity, chemicals, hydrogen, and liquid fuels. Advanced gasification configurations create high pressure syngas with concentrated carbon, and is the technical basis for program-supported R&D expected to achieve relatively low-cost CO_2 capture. In FY 2012, the Gasification Systems program will continue to develop technologies for gas stream purification to achieve near-zero atmospheric emission goals and to meet synthesis gas quality requirements for use with fuel cells and conversion processes; to enhance process efficiency and availability; to reduce costs for producing oxygen; and to develop advanced gasification technologies.

Cross-cutting Research (FY 2012 Request: $42.8) — This activity serves as a bridge between basic and applied research. For FY 2012, an increase in funding computational modeling and simulations will support efforts to develop a defensible, science-based quantitative methodology for determining risk profiles at carbon dioxide storage sites, and enable the development and deployment of state-of-the-art computational modeling and simulation tools to accelerate the commercialization of carbon capture tech-

** FY 12 Budget Request, $ in millions*

nologies. Funding is also requested for energy analyses, university training and research, and international activities.

Petroleum Reserves

➢ Strategic Petroleum Reserve (FY 2012 Request: $121.7) — The FY 2012 budget request maintains the operational readiness of the SPR to ensure a 4.4 MMB/Day drawdown rate. The SPR program is environmentally responsible and fully responsive to the needs of the nation and the public. The FY 2012 budget also includes funding to complete construction activities and transfer oil from an existing Bayou Choctaw site cavern to a replacement cavern and for degas operations to begin at the West Hackberry site; and provides for operations and security at SPR's four storage facilities. The decrease assumes cancellation of $71 million in balances from prior year appropriations for a billion barrel expansion at the Richton, Miss., site and the use of these balances to partially fund operations and management activities. The overall program decrease is attributable to degas site modification construction at West Hackberry that occurred in FY 2010; reduced costs associated with the Bayou Choctaw replacement cavern; a reduction in power charges; and, due to no funding being requested for expansion.

SPR Petroleum Account: The SPR Petroleum Account provides for the acquisition, transportation, and injection of petroleum into SPR, including U.S. Customs duties, terminal throughput charges, and other related miscellaneous costs. The FY 2012 budget proposes a $500 million non-emergency sale of SPR oil, which will provide DOE with operational flexibility in managing the reserves. The sale will require SPR to sell approximately 6 million barrels of oil, which will reduce the inventory from nearly 727 million barrels to about 721 million barrels and lower the SPR import protection from approximately 75 days to 74 days. The receipts from the sale will be deposited into a receipt account for the SPR asset sale that will automatically go to the U.S. Treasury.

➢ Northeast Home Heating Oil Reserve (FY 2012 Request: $10.9, Offset due to excess balances: $79.0) — Funding will preserve the reserve's ability to respond to fuel oil emergencies in New England and continue operations, including lease of commercial storage space. In FY 2011, the program sold 1,984,253 barrels of Heating Oil and will use the receipts to purchase 1 million barrels of Ultra Low Sulfur (ULS) distillate to comply with the requirement to convert Heating Oil to ULS distillate to meet new state legislation. New storage contracts will also be awarded. Remaining net balances from the sale are proposed for cancellation in FY 2012.

Members of the Visualization Research Group in the National Energy Technology Laboratory's Office of Research and Development develop capabilities to visualize data and advanced power generation systems. From left, Brian Dotson, engineer; Terry Jordan, computer scientists; and Maya Sunil, computer analyst, study a visualization of a power plant component.

➢ Naval Petroleum & Oil Shale Reserves (FY 2012 Request: $14.9) — In FY 2012, the NPOSR program will continue Elk Hills environmental closeout efforts plus activities related to the settlement of ownership equity shares with the former unit partner in the NPR-1 field, Chevron U.S.A., Inc. DOE is currently in mediation with Chevron U.S.A to settle the NPR-1 Equity. If mediation fails, the Federal Judge will likely proceed with her decision. Since production costs are expected to exceed oil revenues, production operations at NPR-3 are no longer economic and will be discontinued except for incidental oil production associated with produced water needed for geothermal testing. Accelerated environmental restoration will continue consistent with the 2007 Environmental Liabilities Study and restructuring activities will commence. A plan will be developed for the sale or disposition of NPR-3. Consistent with the elimination of appropriated funding for testing in FY 2011, the geothermal testing will be limited to 100 percent funds-in projects and those projects wholly funded by EERE's Geothermal Technology Program. Environmental remediation will be performed on those facilities that no longer have value to the geothermal testing mission. Oil production from NPR-3 is expected to average about 40 barrels per day provided that EERE funds geothermal testing.

Fossil Energy Budget

Area	Program	FY 2012 Request (Thousand $)
Research & Development		
	CCS Demonstrations	
	(CCPI, FutureGen 2.0, Industrial CCS)	$0
	CCS & Power Systems	
	Carbon Capture	$68,938
	Carbon Storage	$115,477
	Advanced Energy Systems	$64,193
	Cross-cutting Research	$42,750
	Total CCS & Power Systems	$291,358
	Other R&D Programs, Direction Management Support	$184,624
	Use of Prior Year's Funds	($23,007)
	Total, Research and Development	$452,975
Petroleum Reserves	Strategic Petroleum Reserve	$121,704
	Northeast Home Heating Oil Reserve	($68,881)
	Naval Petroleum Reserves/RMOTC	$14,909
	Total, Petroleum Reserves	$67,732
	Total Fossil Energy Budget	$520,707